COMMODORE
PERSONAL
MINI-COMPUTER

MODEL SR 7949D

Owner's Manual

...notation calculator is a 19-key, 50-function machine. Once you have become familiar with its keyboard and its versatile display, you will be able to perform a broad range of basic and advanced calculations.

The functions indicated by legends on the calculator's keyboard are treated in this manual as follows:

(a) legend above key
(b) upper case
(c) lower case

(a) To enter the lower case function press the 5 key.

(b) To enter the upper case function, use the key sequence: F_1 Cos

(c) To enter the function above the key, use the key sequence F_2 Cos⁻¹

To clearly express these key sequences, we will underline the function with either one or two underscores as a reminder that either the F_1 or F_2 Key must be pressed prior to the function. The absence of an underscore represents a lower case key entry.

The Display

Scientific Notation

—	123.45	—	99
sign of mantissa	mantissa	sign of exponent	2-digit exponent

Your calculator automatically displays the first five digits of a 10-digit mantissa. These appear

in the left of the display window. To read the second five digits of the mantissa, press: F1 5→10. The display will show the second set of numbers at the left and 3 dashes in the right side of the window. The dashes advise that we are looking at the second half of the mantissa.

Example:

(a) $1 \div 7 = 0.1428$

(b) F_1 $5 \leftrightarrow 10$ = 57142- - -

Example:

(a) 35 F_2 e^x 1.5860 15

(b) F_1 $5 \leftrightarrow 10$ 13452 - - -

This means that $e^{35} = 1.586013452 \times 10^{15}$.

To return to our original display (step a):

(1) Press (=) key in all cases except co-ordinate conversion standard deviation or chain operations.

(2) During co-ordinate conversion, standard deviation or chain calculations, press F_1 d/r (*Note:* if angular mode must be retained, press degree/radian key twice)

Note:

Entries larger than 5 digits can be indexed into the machine. While only the first five digits will appear, (unless F_1, $5 \rightarrow 10$ is pressed) any calculation performed will act upon the entire 10 digit entry.

Entry

A number (the mantissa) is entered just as written using the keys 0 through 9. The sign of the mantissa can be entered at any time during

a numerical entry by pressing the change sign key +/-.

The sign of the exponent can be changed by pressing the change sign key after the EE key (enter exponent key) has been pressed.

The exponent field is blank until EE is entered.

C/CE.

The clear entry/clear key. Pressing the C/CE during or immediately after a numerical entry will clear the display. Prior entries are not disturbed. Pressing the C/CE key in all other cases clears all registers except the memories in your calculator.

Enter:

2 + 3 C/CE 4 = 6 C/CE

clear clear

entry all

To enter ten digit numbers.

(a) If there are ten digits in front of decimal point e.g. 1234567899.

Split the number into two 5 digit parts.

i.e. 12345 / 67899.

The number is then entered

12345 00000 + 67899.

i.e. $12345 \times 10^5 + 67899$.

The key sequence is therefore

12345 F_1, EE, 5 + 67899 =

Display now reads

1.2345 09.

Press F_1, 5 → 10 to read second 5 digits 67899.

(b) If the decimal point is in the last five digits
e.g. 1234567.899.

Split the number into two 5 digit parts
i.e. 12345 / 67.899.

The number is then entered as
1234500 + 67.899.
i.e. 12345×10^2 + 67.899.

Note. The number of the exponential is equal to the number of digits before the decimal point in the second half.

The key sequence is therefore
12345, F_1, EE, 2 + 67.899 =

Display now reads
1.2345 06

Press F_1, 5 → 10 to read second 5 digits 67899.

(c) If the decimal point is in the first five digits
e.g. 12.34567899

Split the number into two five digit parts
i.e. 12.345 / 67899.

The number is then entered
12.345 +. 0.00067899.
i.e. 12.345 + 67899×10^{-8}.

Note. The magnitude of the negative exponential is given by the number of digits after the decimal point in the complete number.

The key sequence is therefore:
12.345 + 67899 F_1, EE, F_2 +/- 8 =

Display now reads 12.345

Press F_1 5-10 to read second 5 digits 67899.

Using the Memory

Store: F_1 STO 1 F_1 STO 2

The store keys refer to the two memory registers which store data for future use. When F_1 STO 1 is pressed, the value currently on the display will be copied into Memory Register 1. Similarly, when F_1 STO 2 is pressed, the displayed data is copied into Memory Register 2. Any data stored in the register prior to pressing the respective STO key will be lost. This is referred to as "writing over".

Recall: F_2 RCL 1 F_2 RCL 2

These keys are used to recall data stored in their associated memory registers. The value stored in memory is copied onto the display; the value on display prior to recall is lost while the value stored in memory is unaltered.

Example:

Enter	Read	Explanation:
5	5	Enter 5.
F_1 STO 1	5	Copies 5 into memory register 1.
6	6	Enter 6.
F_1 STO 2	6	Copies 6 into memory register 2.
F_2 RCL 1	5	The content of Memory 1 (5) is copied onto the display. Five remains in Memory 1.

F_2 RCL 2	6	The content of Memory 2 (6) is copied onto the display. Six is retained in Memory 2.

Clear

An individual memory register can be cleared by entering the key sequences:

C/CE F_1 STO 1 Clears memory register 1

C/CE F_2 STO 2 Clears memory register 2

The C/CE key need not be entered if 0. is on the display. However, you must press the desired STO key to overwrite the existing data in memory with the 0 value on the display.

Chain Calculations

Example: $\frac{3 \times 4}{5} \div .3$

Key Sequence: 3 x 4 ÷ 5 ÷ .3 = 8.

Chaining with Parenthesis Keys

F_1 (F_2)

The open and close parenthesis keys provide another level of priority in arithmetic calculations.

For example let's solve the equation:

$y = 3 Z^3$ where $Z = 4e^{-t} + e^t$ and $t = 3$

The key sequence is:

3 x F_1 (4 x 3 F_2 +/- F_2 e^x + 3 F_2 e^x F_1)

F_1 y^x 3 =

Exchange Register Key

F_1 $x \leftrightarrow y$

The exchange key reverses the order of the operands and is used with the four function keys (+ - x -) as well as to enter and display calculations for the function $F_2 \rightarrow R$.

$F_2 \rightarrow P$ and $F_2 \bar{x} \rightarrow \sigma$ $F_2 \bar{x} \rightarrow s$

Reciprocal Key

F_2 $1/x$

The reciprocal or inverse function key computes the inverse of a number on the display and instantly displays the result.

Power and Root Keys

F_2 x^2

The Square key raises the number currently on display to the second power.

$F_1 \sqrt{x}$

The Square Root key takes the square root of the number currently on display.

F_1 y^x

$F_2 \sqrt[x]{y}$

Example 3^4

Enter 3 Read 3
" F_1 y^x 1.0986
" 4 = 81

With the power key, a number raised to any power (or root) can be calculated The base is entered first, then the power to which the base is to be raised. Observe that the Ln is displayed when the power key is pressed. Therefore, negative bases are not permitted.

Logarithmic Functions

F_1 log

Calculates the common logarithm (log_{10}) of x.

F_2 10^x

Calculates the common antilogarithm of x.

F_1 ln

Calculates the natural logarithm (log_e) of x.

F_2 e^x

Calculates the natural antilogarithm of x.

Trigonometric Functions

F_1 sin

Calculates sine of x.

F_2 sin^{-1}

Calculates inverse sine of x.

F_1 cos

Calculates cosine of x.

F_2 cos^{-1}

Calculates inverse cosine of x.

F_1 tan

Calculates tangent of x.

F_2 tan^{-1}

Calculates inverse tangent of x.

Your calculator will find the sine, cosine, tangent, arc sine, arc cosine and arc tangent of any number on display in either degrees or radians. The calculator is in degree mode when turned on. Pressing the F_1 d↔r key key shifts your calculator to radian mode, lights a decimal point in the exponent field.

Pressing F_1 d↔r shifts the calculator back to degree mode. Pressing F_2 d↔r key performs the same function and also converts the display to degrees or radians.

Mean and Standard Deviation Calculations

F_1 X_n

F_2 $\bar{X} \rightarrow s$

Mean and Standard deviation can be calculated with these two keys. The series of values to be averaged is entered by the F_1 X_n key. The mean standard deviation is calculated when the F_2 $X \rightarrow s$ key is pressed. The mean is displayed first and the standard deviation can be recovered by pressing the exchange key F_1 x↔y. The standard deviation provides a measure of the distribution of values about the mean. The second memory register is used for accumulating and must be cleared before the mean calculation is begun.

$$\text{mean } \bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i$$

$$\text{standard deviation } s = \left[\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1} \right]^{\frac{1}{2}}$$

Example:

You throw darts and note the points obtained on 8 throws: 21, 17, 13, 25, 9, 19, 6, 10. What is your average mark and your standard deviation?

Enter	Read	Explanation:
21	21.	
$F_1 X_n$	21	enter x_1.
17	17	
$F_1 X_n$	17	
6	6	
$F_1 X_n$	6	
10	10	
X_n	10	

Now by pressing F_1 $x \rightarrow y$ you will display the number of throws: 8. Now press F_1 $x \rightarrow y$ again to get back in the standard deviation computing mode:

Enter	Read	Explanation
F_2 $\bar{x} \rightarrow s$	15	get $\bar{x}$
F_1 $x \rightarrow y$	6.568322247	get s

Your average mark is 15 and you deviate from it by a 6.57 spread.

Summation Key

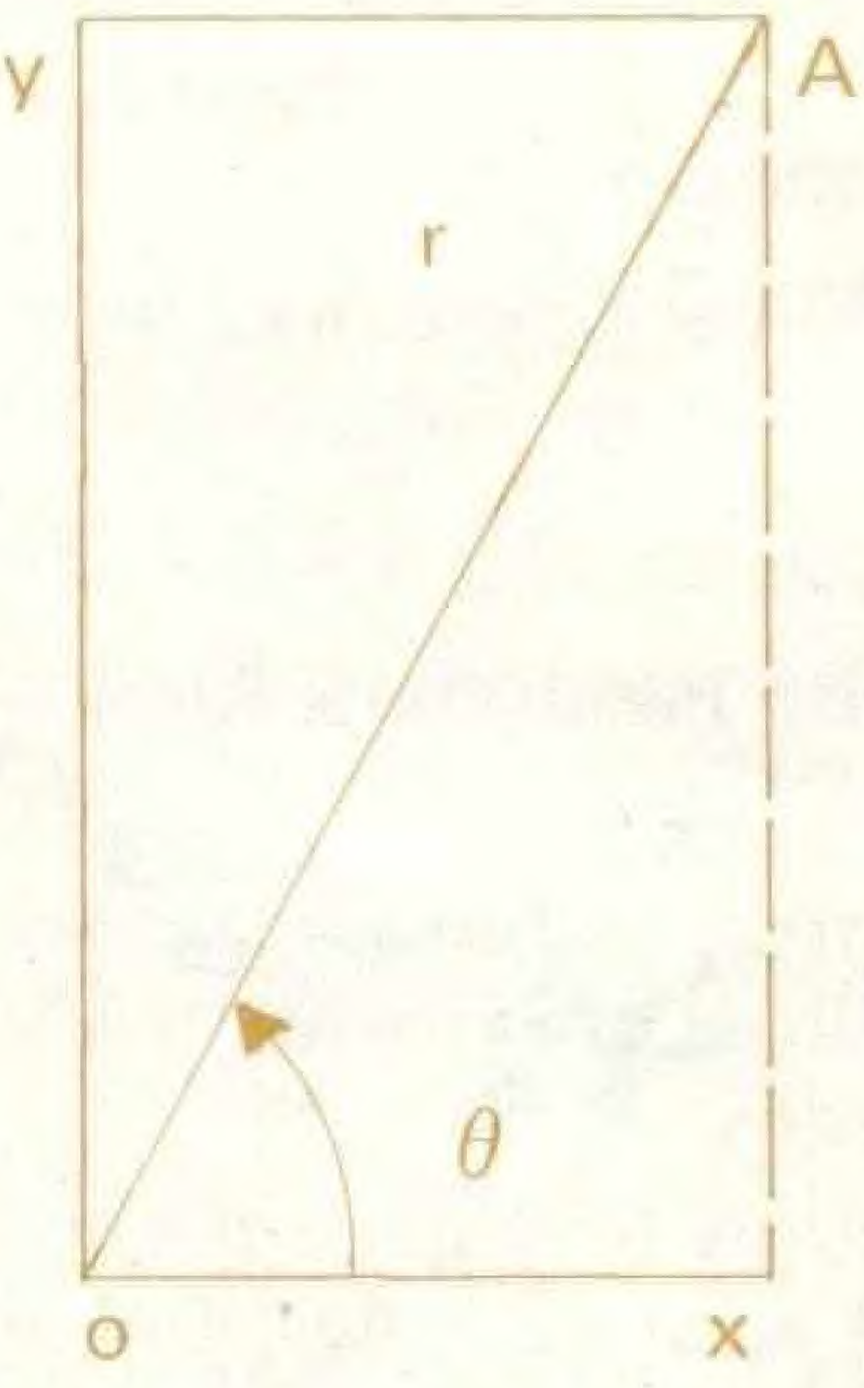
$F_1 \underline{\Sigma 1}$

The summation key, when pressed, adds the number on display to the value stored in Memory 1. Both negative and positive numbers can be accumulated in Memory 1. It is good practice to clear Memory 1 before using the F_1 $\Sigma 1$ key with the key sequence

C/CE.F_1 STO 1

Special Applications

Polar/Rectangular Coordinates Conversion



A point "A" may be identified either by its rectangular co-ordinates, x, y or its polar co-ordinates r, θ.

We have: $x^2 + y^2 = r^2$ and $x = r \cos \theta$, $y = r \sin \theta$. Your mini computer identifies the first entry as x or r, the second as y or θ. The second entry is separated from the first one by using the F_1 $x \rightarrow y$ (exchange) key.

Example:

Enter:	Read:
3 (x) F_1 $x \rightarrow y$	0.
4 (y)	4.
$F_2 \rightarrow P$ key (to polar)	5. (r)
F_1 $x \rightarrow y$	53.13010235 degrees (θ)

Now your mini computer acts as if you had entered 5 (r) first and then : 53.13010235 second. Press $F_2 \rightarrow R$ (to rectangular) read: 3 (x) press F_1 $x \rightarrow y$ and read 4 (y).

Error Condition

An error condition results when an improper operation is performed or when the result of an operation overflows or under flows the absolute range of the calculator.

When an error condition occurs the letter "E" is displayed.

Press the clear key to clear the error condition.

Improper Operation:

F_1 $X \div Y$	where $Y = 0$
F_1 Y^x	where $y < 0$
F_2 $\sqrt[x]{y}$	where $X < 0$
F_1 $\sqrt{X}$	where $X < 0$
F_2 $\bar{x} \rightarrow s$	where number of entries is 0
F_1 $\ln X$	Where $X \leqslant 0$
F_1 $\log X$	where $X \leqslant 0$
F_2 $\sin^{-1}$	where $\lvert X \rvert > 1$
F_2 $\cos^{-1}$	where $\lvert X \rvert > 1$

Overflow

Occurs when a computed result is greater than $9.999999999 \times 10^{99}$.

Underflow

Occurs when a computed result is less than 1.0×10^{-99}.

Operating Accuracy

The precision of your calculator depends upon the operation being performed. Basic addition, subtraction, multiplication, division and reciprocal assignments have a maximum error of ± one count in the tenth or least significant digit.

While countless computations may be performed with complete accuracy, the accuracy limits of particular operations depend upon the input argument as shown below.

Function	Input Argument	Mantissa Error (max.)
$\sqrt{x}$		1 count in D_{10}
ln x		1 count in D_{10}
log x		1 count in D_{10}
e^x		1 count in D_{10}
y^x		1 count in D_{10}
sin ø	$0^o \leqslant /ø/ \leqslant 360^o$	8 counts in D_{10}
	$0 \leqslant /ø/ \leqslant 2\pi$	
cos ø	$0^o \leqslant /ø/ \leqslant 360$	8 counts in D_{10}
	$0 \leqslant /ø/ \leqslant 2\pi$	
tan ø	$0 \leqslant /ø/ < 89^o$	4 counts in D_{10}
	$89^o \leqslant /ø/ \leqslant 89\text{-}5^o$	1 count in D_6
$\sin^{-1} x$	$10^{-10} \leqslant /X/ \leqslant 1$	E 5X 10^{-10^6}
$\cos^{-1} x$	$10^{-10} \leqslant /X/ \leqslant 1$	E 5X 10^{-10}
$\tan^{-1} x$		E 5X 10^{-10}

Dn = Nth display digit assuming a left justified digit result.

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